AISI Technology Projects Research Review

Summary of Findings from Cycle One 2000-2001 to 2002-2003

ALBERTA INITIATIVE FOR SCHOOL IMPROVEMENT (AISI)

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LEARNING

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This document is available on the Internet at:
http://www.learning.gov.ab.ca/k_12/special/aisi/pdfs/techprojectsreview.pdf

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ALBERTA LEARNING CATALOGUING IN PUBLICATION DATA

Alberta Initiative for School Improvement.
AISI technology projects research review : summary of findings from cycle one 2000-2001 to 2002-2003.

ISBN 0-7785-3810-9

1. Educational technology - Research - Alberta. 2. School improvement programs - Alberta. 3. Educational change - Alberta. I. Title.

LB1028.3.A333 2004 371.3

105-02232/

Foreword

This research review was conducted to provide information that would inform Alberta Learning and school jurisdictions in their future efforts to implement learning and technology initiatives in Kindergarten to Grade 12 (K-12) schools. Although direction was given to the researchers/writers to establish parameters for the task, the content of this document reflects the writers' perspectives on topics and subjects reviewed and does not necessarily reflect the position of Alberta Learning.

Alberta Learning would like to acknowledge the contributions of Dr. Jim Parsons and his research team at the University of Alberta in conducting this review.

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Executive Summary

This paper reviews a study conducted by a research team from the Faculty of Education at the University of Alberta. The study reviewed twenty-five medium- to high-effect size AISI (Alberta Initiative for School Improvement) technology projects as a means to understand how the use of technology might be better applied within Alberta classrooms.

Study Data

Three sources of data were analyzed for this report:

1. Information collected from Cycle One AISI annual reports (2000-2003);
2. Information gathered from a focus group made up of key staff from six of the twenty-five medium- to high-effect size projects; and
3. Information gathered from telephone interviews from the other nineteen medium- to high-effect size projects in the study.

Key Findings

Generally, the findings of the report are:

1. The use of lead teachers who have both technological savvy and people skills improved the implementation of technology within classrooms.
2. Teachers responded positively to initiatives that helped them eliminate risks of technology not working, taught new skills that could be applied immediately, and provided opportunities to work collaboratively with other teachers.
3. The presence of physical technology resources encouraged exploration with the technologies.
4. Project-based and peer-to-peer teaching (for both students and teachers) correlated highly with project success.
5. School Web sites and e-mail helped teachers and schools communicate effectively with parents.
6. Parental support for student learning was encouraged when students' successes were shared and celebrated with parents.
7. Projects that integrated technology into regular curricula were more successful than those that tried stand-alone technological training.
8. The most effective professional development was specific to curricular needs and was embedded into the daily lives of teachers instead of being delivered in one-time, general workshops.
9. Meta-cognitive thinking and constructivist pedagogy produced effective classroom learning.
10. Long-term, big-picture thinking characterized these successful projects.

Themes Emerging From the Findings

The following key themes were determined to hold the most promise for using technology in the classroom to benefit student learning:

1. Creating a culture of collaboration in both learning and leadership;
2. Applying meta-cognitive, project-based teaching methods;
3. Providing teachers with the tools and professional development they need to learn technological skills; and
4. Encouraging life-long learning in teachers as a way to improve student learning.

Introduction

The Context of AISI Technology Projects

The Alberta Initiative for School Improvement (AISI) was developed through a collaborative partnership in 1999 and first implemented in all Alberta school authorities in the 2000-01 school year. Partners include the Alberta Home and School Councils' Association; the Alberta School Boards Association; the Association of School Business Officials of Alberta; The Alberta Teachers' Association; the College of Alberta School Superintendents; Alberta Learning; the Universities of Alberta, Calgary, and Lethbridge; and the Faculté Saint-Jean.

The goal of this program is to improve student learning and performance by fostering initiatives that reflect the unique needs and circumstances of each school authority. Alberta Learning, through targeted AISI funding, provided $68 million annually to school authorities for specific local school improvement projects for three years from 2000-01 to 2002-03. The government's commitment to fund AISI has been extended for a second three-year cycle from 2003-04 to 2005-06.

Scope of AISI

Over 800 AISI projects were developed and implemented by public and private school authorities throughout Alberta during the first cycle (2000-03). All provincially funded school authorities in Alberta participated in the first cycle of AISI. This included 74 public school authorities (public, separate and charter schools and Francophone authorities) and 231 private school authorities (115 private schools and 116 ECS private operators). AISI's major focus areas included early literacy, reading intervention, technology integration, mathematics improvement, character education, and other locally developed school improvement projects.

AISI Technology Projects

Ninety-five Cycle 1 AISI projects (approximately 12% of all AISI projects) focused on learning and technology, and as many as 141 (18% of total) projects included some aspect of technology in their implementation. The majority of technology-focused projects concentrated on integrating information and communication technology (ICT) outcomes throughout curricular areas. Other approaches included project-based learning and online/virtual learning.

Although the AISI technology projects were diverse and unique to school authorities, findings consistently reported similar themes and key factors. Because these themes and key factors were consistently evident, the researchers conclude that they are integral to the successful integration of technology into core curricula.

Alberta's ICT Curriculum

Alberta Learning has articulated the following vision for the role of technology in the province's Kindergarten to Grade 12 (K-12) schools.

> *The Alberta Information and Communication Technology (ICT) curriculum provides a broad perspective on the nature of technology, how to use and apply a variety of technologies, and the impact of ICT on self and society. Students in Kindergarten through Grade 12 will be encouraged to grapple with the complexities, as well as the advantages and disadvantages, of technologies in*

> *our lives and workplaces.* ***The ICT curriculum is not intended to stand alone, but rather to be infused within core courses and programs****. Technology is best learned within the context of applications. Activities, projects and problems that replicate real-life situations are effective resources for learning technology* (Alberta Learning, 2004).[1]

Many of the projects under review in this study used AISI funding to learn new technologies and integrate these with curricula.

Purpose of the Report

The purpose of this report is to inform future ICT initiatives and activities in Alberta K-12 schools by answering the following question:

> ***What have we, as a provincial learning system, learned from these AISI technology high- and medium-effect size studies?***

This document highlights key learnings from high- and medium-effect size projects in the first three-year AISI cycle and provides a synthesis of findings drawn from the projects' 2000-2001 to 2002-2003 AISI Project Final Report (APFR) Section G summaries. Each AISI Project Final Report had many sections, each alphabetically listed from A to H. Section G summaries are especially fruitful for investigation because they contain (1) narrative reviews of each AISI project, and (2) explication of each AISI project's success written by local school jurisdiction AISI coordinators or other jurisdiction personnel who are familiar with a given project. They also contain a variety of other personal insights that, when taken together, highlight project specifics that quantitative data alone could not provide.

This study draws specifically from APFR G section data; therefore, in this report the phrase "annual report" is used to describe G section data and not the APFRs in their entirety.

Report Limitations

Although data was triangulated and findings were redundant, the researchers recognize that their work has limitations. The exploratory nature of this work lent itself well to a qualitative approach, meaning that findings are descriptive rather than predictive in nature. Findings provide insight into the range of opinions held by study participants, not a population at large; and, while helpful for setting general directions or goals, may not be specifically applicable in other contexts, nor serve to offer any specific predictive value.[2]

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[1] Alberta Learning (2004). *ICT program of studies: Rationale and philosophy*. Available at http://www.learning.gov.ab.ca/ict/ictfront.asp

[2] Adapted from Industry Canada (2004). *Young Canadians In A Wired World – Phase II Focus Groups: Key Findings*. Available at http://www.media-awareness.ca/english/special_initiatives/index.cfm

Descriptions of AISI Technology Projects

AISI technology projects ranged widely in how they utilized technology pedagogically and in the curricula. Variables included technological integration into the curricula; encouragement of technological growth; creation of new pedagogical structures such as mentoring and creating lead technology teachers; creation and encouragement of constructivist teaching and learning; project-based curriculum structures; development of multimedia rooms; mobile computer labs; the development of research skills utilizing technology; and a variety of other e-learning enterprises. A more specific description of each project is provided in Appendix One, including a one-paragraph summary description of each of the 25 projects.

The general characteristics and scope of each project, including the grades and number of students and schools involved, appear in the table below. Numbers in the final column may be cross-referenced to individual project descriptions in Appendix One.

Grades	Number of Students	Number of Schools	Theme	Appendix Reference #
K-5	200+	1	Learning Leaders and Technology	8
K-6	200+	1	Technology Integration	4
K-6	300+	1	Technology Growth	3
K-6	900+	5	Mobile Computer Lab	17
K-6	300+	1	ICT Integration	11
K-6	600+	2	Information Literacy	19
1-6	100+	1	Technology Integration	10
K-9	<100	1	Research Skills and Resource Enhancement	20
K-9	<100	1	Outcome-based Learning with Technology	21
K-9	100+	1	Technology Resources	25
1-9	600+	1	Instructional Technology Integration	2
1-9	300+	1	Laptop Classroom	6
1-9	<100		Multimedia Commons Room	13
K-10	<100	1	Computer Literacy Improvement	18
4-10	<100	1	Technology Integration	22
7-9	700+	2	Technology Mentorship Program	16
K-12	500+	1	Learning Enhancement in Math & Science	24
K-12	200+	1	Information and Communication Technology Enhancement	9
1-12	6,000+	17	GENA Supported Technology Integration	5
1-12	500+	1	Technology Integration	14
6-12	200+	1	Transforming the Learning Environment	15
7-12	<100	1	Information Technology Integration	23
10-12	2,000+	2	Technology Integration	1
10-12	200+	23	Distance Education	12
10-12	<100	4	Technology for Alternate Delivery	7

Key Findings from AISI Technology Projects

Finding One: Effective Project Supports in the Form of Staff, Time and Technology

1.1 Lead Teachers

- Successful projects cited that a dedicated and highly qualified lead teacher/technical support facilitator/AISI-ICT project coordinator was critical to project success.
- Highly qualified was interpreted to mean excellent interpersonal skills, as well as excellent technological skills in a teacher who is familiar with grade-specific curricula. This person worked best when he or she served as an ongoing resource to all staff.
- The roles of the lead/technical support teacher included overseeing all projects and helping teachers integrate technology into curricula. This support person provided professional development to teachers via one-on-one tutoring, formal small-group instruction, and informal "just-in-time" learning and practice during on-site trouble-shooting activities.
- The lead teacher facilitated classroom activities, modeled instructional strategies for teachers, assisted teachers in classrooms and labs, helped to develop student projects geared to appropriate curricula and student grade levels, and ensured that all technology was functioning reliably.
- The lead/technical support teacher facilitated both teacher and student growth by acting as a team teacher, researcher, planner, and assessment tool developer. Generally, this individual might act in any support capacity toward the development and delivery of successful lessons and technologically enhanced projects.

1.2 Teacher Support

- Projects confirmed that teachers need ongoing support to minimize or eliminate risk of failure, both from the standpoint of specific technical hardware/software issues as well as pedagogical concerns arising from teaching with technology.
- Successful student and teacher learning was facilitated when the lead teacher helped make colleagues more aware of the potential for technology applications in the classroom by showing where these were relevant and providing examples of appropriate and constructive uses.
- Successful projects allotted time for teachers to learn new skills, practice or apply new skills with support, and reflect on best practices with peers. These stages were best facilitated with teacher on-site release time, rather than in professional development (PD) workshops.
- Creating and supporting a "culture of collaboration" among teachers (and students) was critical to success in these projects. Collaboration included team teaching, working in small groups, or learning one-on-one with one another and with technical support. In one school, the students formed a help desk to support the teachers in integrating technology into curricula—collaboratively sharing their knowledge, samples, and resources with teachers. Developing a learning community was an outcome of many of the most successful projects.

- Successful ICT projects "allowed teachers time to become familiar with ICT and adjust their learning styles to include technology."
- Teachers reported the need for daily access to resources, support, and IT help in their classrooms. Some projects built booklets and had technical support staff create "tips sheets."

1.3 Physical Resources

- Many high-effect size projects developed and maintained a collection of ongoing resources for current and incoming teachers. These resources included printed booklets, technical checklists, successful concepts and creative ideas, Web sites and other Internet-based resources for developing projects and troubleshooting technology.
- Access to functioning, up-to-date labs and/or mobile laptops was critical to creating successful learning environments.
- Teachers and students required quality physical resources and accessible labs that accommodate entire classes. Once confidence and excitement for technological integration was generated, the lack of quality resources (i.e., software, hardware, lab access, reliable computers) became an issue for several schools.
- Digital cameras rose to the top as a technology item that produced *exciting* projects and successfully engaged both learners and teachers.
- In a number of projects, mobile technology, in the form of laptops, contributed to high-effect size changes, and was seen as an effective and accessible way to integrate technology into curricula, within and beyond the classroom.

1.4 Teacher Training and Professional Development

- Peer-to-peer teaching, team teaching, and group mentoring were successful methods for ongoing professional development. 'Teachers working with other teachers' was seen as an excellent way to inspire, support, and increase learning.

Finding Two: Effective Communication Strategies

- Web sites, standard newsletters and parent-teacher-student conferences were the primary tools used to keep parents informed. Parental involvement in technological integration projects was sparse to non-existent in many projects. However, parental support and appreciation for the projects was often high.
- Developing school-based Web sites for improved communication, access to homework and projects, and celebrations of student successes were cited as helpful in facilitating successful AISI projects. Web sites were an effective way to engage parents in AISI and other school projects.
- E-mail was a successful means of reaching and communicating with parents and was often supplemented with a Web site through which parents, teachers and students could communicate and stay connected.
- Projects that required building Web sites were very successful in engaging parents and students. Web sites increased student accountability; for instance, homework assignment details and resources were readily accessible online, which encouraged students to develop time and project management skills.

- Numerous successful projects developed Web-based resources that teachers, students, and parents could access to learn more. Web sites were developed to provide access to professional development materials, to demonstrate project/student successes, and to offer ongoing technical and information support.
- Celebrations of Learning were also a successful means of engaging parental support and interest.

Finding Three: Technology Embedded in Professional Development and Curricula

3.1 Curriculum Integration

- Projects that integrated technology into regular curricula were more successful than those that tried stand-alone technological training.
- Teachers learned more when they had opportunities to take risks integrating technology into core curricula; however, they took fewer risks and created fewer projects without the on-site support of a technically skilled facilitator.
- Successful projects embedded technology learning into the regular curricula. The focus was less on computers and more on best practices in teaching and learning. Successful projects provided technical facilitators who helped teachers teach curricula in new and different ways. Students came to use technology that best fit curriculum need.
- Technology worked best when it was NOT a stand-alone initiative, but when it was integrated to assist learning or provide alternative learning methods.
- Technology was invisible when used appropriately. Students were engaged in thinking processes and problem solving within the lesson instead of being distracted by the equipment or software.
- In this cycle of AISI projects, language arts, social studies, and science proved to be the curricula most effectively enhanced and supported by technology. Projects reported their highest successes in writing skills, meta-cognitive thinking, and increased timeliness (projects completed on time) when technology was integrated into learning.

3.2 Professional Development

- Professional development worked best when (a) it was embedded into the daily lives of teachers; and (b) it happened during regular class time instead of taking place only on in-service days, weekends, and during the summer.
- Successful projects stressed the need to embed professional development into daily classroom activities, as opposed to providing one-time weekend or professional development day workshops.
- The most successful professional development models were those that used one-on-one, peer, and small group methods. This model was also effective with student learning—moving from lecture to small group and one-on-one training proved successful in all projects.

3.3 Constructivist Teaching and Learning

- Technology projects increased a focus on meta-cognition, where new technology prompted teachers to look at *how* students learn, and not just *what* they learn.

- Combining constructivist learning methods/models or other forms of instruction (e.g., project-based teaching) with technology created successful outcomes. Constructivist orientations to learning were effective when they integrated technology into core curricula.
- Technology projects increasingly helped teachers develop a constructivist orientation to teaching subject matter.
- Projects that integrated higher-order thinking, collaborative approaches, or project-based learning models/methods were successful.
- When teachers increased their confidence and competence with technology, they created projects that enhanced students' learning. Successful teachers moved from using technology for its own sake to activities that focused on communicating, inquiring, and thinking skills.
- Adopting and developing a project-based/inquiry-based (or action research) method of teaching and learning was instrumental to success in all projects.

Finding Four: Long-term Vision and Planning

- Tracking goals and progress over time was found to be most effective when done by one individual assigned to monitor all projects. Teachers who set individual goals at the beginning of the project and tracked their progress were more successful; that is, they reported the most improvement.
- Successful projects stated that success was gained by thinking "long term" on integration projects. The more successful programs were built upon over three years. Continuity was found to be imperative to success and presented a challenge for schools experiencing high staff turnovers.
- Several successful projects systematically identified and tracked goals and technology-based learning objectives.
- Success was most predominant in elementary, middle, and junior high levels.

Themes Emerging from the Findings

Theme One: Creating a Culture of Collaborative Learning/Leadership

1.1 SHARE LEARNING, SHARE TECHNOLOGY, SHARE TEACHER EXPERTISE, AND SHARE RESOURCES

Medium- and high-effect size projects stated that teachers and administrators made a commitment of time and resources to teaching new skills to one another. Among each group of teachers, a few recognized "Team Leads" or "Master Teachers" were either hired or "released" to serve as ICT mentors or coordinators for other team members.

1.2 PROFESSIONAL DEVELOPMENT THROUGH SHARED LEARNING OR MENTORSHIP

Traditional one-shot, large-group training professional development days were less effective than peer-to-peer or one-on-one on-site mentoring for encouraging both professional development and ongoing learning. The most positive results were reported to occur when team leads possessed both high technical and content knowledge and excellent interpersonal, mentoring skills. Regardless of what title they were given within projects, these lead/mentor teachers were effective because they understood the challenges of facilitating adult teachers' learning in a high pressure K-12 environment. They were able to meet the needs of each individual teacher respectfully, assuring that each team member's personal learning and professional growth was supported within his or her daily work environment. This work was difficult, but projects (over 74%) that created a designated mentor/coordinator as a key resource person were more successful and project personnel stated that success was conditional upon having this dedicated mentor/team lead on site.

Successful projects saw teachers dedicating regular times to meet and discuss progress and to share "best practices" with peers. This peer or mentorship support transferred to classrooms and worked especially well for high-risk students. A team-teaching approach, where team teachers consciously built upon each other's strengths and kept the information flowing to students as consistently as possible, was effective. Collaboratively planning, designing, and implementing projects created a highly cooperative and energized learning environment for both teachers and students.

1.3 DEVELOP AND SHARE RESOURCES: A LEGACY OF LEARNING

In successful technology projects, a collaborative culture led to the development of useful and accessible resources for teachers, students, and parents to use for further learning and support. When teachers shared their expertise and ideas by creating media, Web sites, booklets, newsletters, or by participating in small group discussions, enthusiasm for successful projects spread throughout the school community. New teachers coming into the schools were provided access to the templates and projects and could "come up to speed" sooner.

Theme Two: Applying Meta-Cognitive, Project-based Methods of Learning

In successful projects, the focus was less about learning new tools—be they technology tools or new concepts of learning—and more about *how* new tools or strategies could be applied to *enhance* core curricular learning. Opportunities to learn teaching strategies/methods that called on higher thinking or meta-cognitive processes in learning—those that explored not only *what* was learned but *why and how*—were cited as key to successful learning.

When teachers collaboratively planned, designed, and co-created *real-life applications* for new technologies or alternate forms of teaching, they worked fruitfully to build resources and explore new "possibilities" on their own. Given the opportunity to learn, and then apply that learning *with ongoing support*, most teachers reported increased confidence, self-esteem, and a commitment to continued learning. They saw benefits in students' successes and seemed to gain increased courage and enthusiasm to employ new teaching and learning strategies. This enthusiasm positively impacted the entire culture of several schools.

Project-based or inquiry-based learning was a common practice in medium- and high-effect size projects. Project-based or inquiry-based models were used to teach both teachers and students and were further enhanced through mentorship. Teachers learned to enhance specific core curricula and grade-specific assignments through the integration of technology. Students were assigned projects that required them to use technology as a means to research, create, and present their findings. This method of learning, as opposed to textbook, lecture, and testing methodologies, was reported to motivate and excite students to learn and creatively present their knowledge to others.

Theme Three: Giving Teachers and Students the Tools to Learn

Twenty-three of the twenty-five technology projects stated explicitly that teachers needed technology training and quality tools, technical infrastructure, and relevant software to integrate ICT outcomes into core curricula effectively. When teachers became more aware of the benefits of integrating ICT into core curricula and witnessed the tangible enthusiasm for learning that ICT-based projects produced, the need for quality technical support and equipment significantly increased. Well-supported labs and technical equipment helped ensure that learning experiences were "seamless" and successful. As a result, technology was not difficult content to be learned but was simply a tool useful for learning core curricular content.

Theme Four: Lifelong Learning

Students thrived when teachers thrived. The growth of teachers was important to the overall growth of students. When the confidence and competence of teachers increased, through ongoing training and support, they used technology to create projects that enhanced students' learning, enthusiasm, and engagement. In turn, this enhanced the learning environment and further inspired teachers' efforts to create interesting and meaningful projects for students. In short, a positive cycle of teaching and learning was established. Teachers responded well to professional development and increased time, support, and resources to integrate new learning methodologies and technologies into the core curricula during the three years of Cycle 1.

AISI technology projects reported the power of mentorship and modeling in learning as teachers' enthusiasm for their own learning "rubbed off" on students. Teachers who were

successfully supported through a culture of collaborative learning, given time and space for peer-to-peer mentorship, and given the technological tools to pursue learning, produced projects that helped students gain a similar mindset, skills base, and enthusiasm for furthering their own learning in relation to the curricula.

Appendix One
Research Methodology

The purpose of the researchers' work in this report was to gather findings from their review of successful AISI technology projects. The audience for this report includes key decision-makers, teachers interested in replicating successful practices, and Albertans interested in school success.

To gather these findings, the researchers used three sources:

1. Annual AISI Final Reports of those AISI technology projects that showed high- to medium-effect sizes when subjected to AISI data analysis (see below).
2. A focus group with key representatives from six selected high and medium AISI projects. This all-day focus group was conducted on February 24, 2004.
3. Telephone interviews conducted with key representatives from all other high- to medium-effect size AISI technology projects (i.e., those not attending the focus group). Fourteen telephone interviews were conducted between February 23 and February 26, 2004.

Together, these three sources of information helped the research team to answer one main question: *What have we, as a provincial learning system, learned from these AISI technology high- and medium-effect size studies?*

Research Review Procedure

The team of researchers included one university professor; four graduate students from the University of Alberta; one full-time AISI project coordinator from the Faculty of Education; and one freelance writer/researcher.

To conduct this report, they followed these procedures:

1. They reviewed the annual reports from 25 high- and medium-effect sized AISI technology projects. These annual reports allowed them to consider the successes, observations, challenges, and project management strategies as perceived by the reporting jurisdictions.
2. They also read a number of the other AISI technology projects, regardless of their effect size, to lend context to their review.
3. From the 25 high- and medium-effect size projects, they chose a focus group based upon geographical proximity (i.e., projects close to Edmonton, as well as projects from different areas of the province) and projects that inspired their interest as a group.
4. Individuals from the high- and medium-effect size projects not included in the focus group were interviewed, using a similar question template, by telephone.
5. After data was collected, they reviewed it systematically and created themes as a team. These themes were sufficiently redundant to win the team's confidence in its validity and allowed the team to synthesize their understandings of lessons learned.
6. The team organized its work into a report that summarized and shared the essence of Cycle One findings for successful ICT projects.

AISI Data Analysis

The following analyses were performed on project data to determine success:

1. Results that met or exceeded annual targets.
2. Results that improved over the baseline.
3. Magnitude of improvement through effect size analysis.
4. Analysis and summary of open-ended responses.

Effect Size Calculation

To determine the extent to which AISI projects improved over the baseline, all the data (baseline and results) were converted to a common scale (standard scores) that permits comparison of improvement regardless of the type of measure (test, survey, etc.) that the school authorities used. The difference between the baseline data and the actual results for each measure in standard scores is equivalent to an effect size in a study involving a control group and an experimental group. This method aids in quantifying the effectiveness of the various AISI projects.

> An effect size of 1.0 indicates an increase of one standard deviation, typically associated with advancing children's achievement by one year, improving the rate of learning by 50%, or a correlation between some variable and achievement of approximately 0.50 (Hattie, 1992, pp. 5-6)[3].

Selection of Medium- and High-Effect Size AISI Technology Projects

The effect size results were then averaged over all the measures for each project and weighted by the number of students involved in each measure. The average effect sizes were grouped into categories of no effect (0 or less), minimum effect (less 0.1 to 0.2), small effect (0.2 to 0.3), medium effect (0.4 to 0.7), and large effect (0.8 or higher). On the basis of the results, twenty-five technology projects were identified as medium to high in effect size and, on this basis, were selected for in-depth qualitative analysis.

Each ICT project was created to reflect the unique needs and circumstances within a particular school authority and to improve student learning and performance in specific and articulated areas. The projects were planned, implemented, and tracked; and the results were reported to AISI through annual reports and summaries. These annual reports formed one of the data sources for this research review. In addition, from the medium- and high-effect size AISI technology projects, several participants were selected to report their key learning in a focus group. The remaining medium- and high-effect size projects were interviewed via telephone.

Focus Group Session

An all-day AISI Focus Group was held on February 24, 2004. Findings from this focus group corroborated findings from the review of the AISI annual reports. However, one new finding emerged that was not captured in the AISI final reports, but was illuminated in the focus group discussion. This was the key role that school administration played in the success of AISI technology projects. School administrators provided valuable service in two ways: by encouraging school meetings between teachers that enhanced the projects, and by providing space in oft-crowded school buildings so that AISI technology projects could succeed.

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[3] Hattie, J. A. (1992). Towards a model of schooling: A synthesis of meta-analyses. *Australian Journal of Education, 36*, 5-13.

Telephone Interviews

Fourteen interviews were conducted between February 23 and 26, 2004. Interviews averaged fifteen minutes, guided by the following interview protocol:

1. What really worked? Why?
2. Describe the role that students played in the projects. What impact, if any, did this have on teacher-pupil or pupil-pupil relationships?
3. Describe the parental involvement in your project.
4. What form/structure of professional development worked best in your projects?
5. What differences, if any, did you note about the integration of technology between elementary and junior/senior high? *Note: Some variation of this question was used according to the school population.*
6. What recommendations or advice would you like to offer key decision makers and other schools/jurisdictions interested in implementing a technology integration project?

Findings from the telephone interviews corroborated the findings from the reviews of AISI annual reports. Information was reinforced but no new information was gained.

Appendix Two
A Summary of Each of the Twenty-Five Medium- and High-Effect Size AISI Technology Projects

1. **Technology Integration #1** is an ongoing ICT integration project conducted for over four years. It has achieved 48 of 49 ICT integration outcomes. Success is attributed to having adequate access to computer labs; asking staff to include technology growth goals in their annual teacher professional growth plan; and continued in-house support. The professional development models utilized were peer, one-to-one, and small group training. The IT teacher in charge of the project also managed the entire project (as opposed to administrators). AISI funds were also used to purchase new computers and equipment and to support the development of a school Web site.

2. **Instructional Technology Integration** project provided both students and teachers with a supportive IT Coordinator who aided in integrating technology into core curricula. Using a "progressive skills checklist", teachers set technological goals and IT Coordinators supported both students and teachers in achieving these goals by providing on-site facilitation, team teaching, research, planning, development of assessment tools, sample projects and all other aspects of development and delivery of technologically enhanced lessons and learning projects. Professional development models used were "just-in-time" team and peer teaching with an IT Coordinator, personalized to the needs of teachers; in-service on software; creation of teaching/enhancement materials for projects; facilitating/troubleshooting in the lab environment; and collegial assessment and discussion of projects (sharing the learning). Outcomes include helpful Web sites, a "culture of collaboration," increased usage of computer stations, interactive whiteboard, scanners, projectors, and digital cameras, and the creation of support materials; i.e., a handbook of technology skills checklists or Web sites. AISI funds were also used to purchase necessary equipment.

3. **Technology Growth** was a three-year graduated project using a project-based approach in which students learned the technology skills appropriate for their projects and age/grade level and built on their technical skills over each year as per team-articulated goals. Technology was integrated into core curricula, not taught in isolation. Technology specialists provided onsite, "just-in-time" technical troubleshooting support. Teachers worked in teams and tracked progress, responses to projects, and outcomes. Release days to work with team members to improve teachers' individual skill levels or to develop student projects proved to be the most valuable PD model.

4. **Technology Integration #2** provided IT integration for both a Grade 1 and a Grade 4 class and tracked the results of integrating technology into core curricula for those classes over three years. Teachers were taught how to use data projectors, digital cameras and a variety of software; however, most of the PD was integrated into daily class time, through the provision of a full-time technical assistant in the lab who helped teachers (one-on-one) in planning, developing, and executing assignments. Teachers developed templates, documents, and related materials for future use by other teachers. Examples include: Grade 6 class producing and publishing sky science PowerPoint projects to the *TELUS Learning Connection* Grassroots Web site, where it will be used by other students, and a clay animation project using storyboards and digital pictures presented to the entire school via PowerPoint at the end of the year. Projects and instructional strategies were individualized to class needs. The technology facilitator was also responsible for managing the projects, displaying projects on Web sites, and making sure that templates were accessible to all teachers and students (technical support). Parents were included via Web sites and celebrations of student work.

5. **GENA Supported Technology Integration**: ICT objectives were met through a partnership with Galileo Educational Network Association (GENA). Technology integration and inquiry-based/constructivist learning initiatives worked well with elementary, middle, and junior high students, but not high school students. Technology was not taught as a discreet set of skills but was instead embedded into core subjects. Students used a variety of "information and communication technologies [for] problem solving, decision making, inquiring and researching in the context of other

(core) subject matter." ICT project members received advice, guidance and support from a Steering Committee comprised of an Associate Superintendent, Director of Technology, and senior staff from GENA. Successful PD was planned *with* participants, built upon over three years, and occurred primarily during the school day. Computers and Intelligence Online (I.O.) licenses were purchased for lead teachers in all schools and provided a medium for online PD and project construction from both at-home and at-school sites. A *TELUS Learning Connection* team also provided PD. Parents were primarily and effectively included via school Web sites.

6. **Laptop Classroom** used laptop computers to integrate technology into core curricula. Teachers attended various tech-development sessions and collaborated divisionally on how to integrate ICT outcomes. Regular time was set aside for teachers to develop skills; then students were trained to work in small collaborative learning groups that used technology for thinking processes, tasks, and problem solving within core curricular lessons. Resources and references, including Web sites, were developed. Parents were kept informed and engaged through Web sites and email.

7. **Technology for Alternate Delivery** allowed students to take a wider variety of courses during high school, utilizing distance online programming. The number of courses offered increased from 127 to an average of 229 courses per year over three years, with a 94% completion rate. Monitoring students through a well-supervised classroom was key to this success. Having AISI staff, principals, and support staff meet regularly online with Alberta Distance Learning Centre staff was an excellent communication strategy. A highly collaborative approach was used for all planning, implementing and monitoring of online learning. Having regular in-house professional development, as well as support materials in the distance education classroom, were also cited as important factors.

8. **Learning Leaders and Technology** focused on team teaching approaches and collaborative ICT planning/tracking for integrating technology into the core curricula. An AISI Leader and teachers cooperatively developed projects and ideas based on current curricula. Key to success was the creation of a "tech team" consisting of Grade 5 students who were trained (during school time) to become technical support to staff and other students. The AISI Leader was hired to support teachers in the lab in implementing various projects. A technology binder was created for every grade level in the school. The binders included ICT skills, ideas, projects, rubrics, and tips geared to given grade levels and curricula.

9. **Information and Communication Technology Enhancement** trained teachers in technology-based instructional skills targeted to appropriate grade levels and allowed teachers time to become comfortable with individual technical skills. Mentors modeled and assisted in instructional strategies, and "just-in-time" technical assistance was available to teachers. Secure student accounts allowed students to work freely with confidence that their work would not be deleted. Labs were converted to a Windows-based system, photocopiers were networked, and more varied technologically based activities and assignments were implemented. A central, coordinated technology resource person was responsible for tracking outcomes. Mentorship and collaborative learning were the keys to success in this project.

10. **Technology Integration #3** identified students with weaknesses in literacy and numeracy and provided them with increased multimedia resources and communication supports from Alberta Distance Learning Centre staff. CD-ROMS, Internet, video, and regular communication tools were used to develop multimedia materials to enhance learning. A site-based technical facilitator helped to increase interaction and communication among all staff, suppliers, students and parents via email, telephone, and a Web site.

11. **ICT Integration** used an on-site Technology Support Coordinator to provide professional development and training to teachers, as well as to assist teachers in developing learning materials utilizing technology. A variety of software and technology were used to develop and publish student projects on the *TELUS Learning Connection* Web site. Technical coordinators worked collaboratively, continuously, and intensely with teachers in grade-specific groups to integrate technology into core curricula.

12. **Distance Education** offered students distance education via Internet and audio-visual conferencing tools. Flexible team teaching—with Alberta Distance Learning Centre specialists supporting classroom teachers—was used to develop 11 courses for online delivery. Students were able to get together with teachers via a phone-in "help desk" and one-on-one tutorial support. Alternative supports required teachers to modify their hours in order to provide homework assistance.

13. **Multimedia Commons Room** provided teachers with the release time and professional development needed to create a multimedia learning room equipped with advanced computers and an interactive whiteboard. The facility allowed both instructors and students to learn real-time, online instructional techniques, and advanced technology skills.

14. **Technology Integration #4** used technology over a three-year period to increase excellence in language arts and social studies. Teachers were encouraged to upgrade their computer skills via professional development and the addition of a "technology class" for each class in the school. Teachers and students were *learning together* through collaboration, observation, and action research. Two digital cameras were used to build yearbooks and contribute to the school Web site. Professional development was provided one-on-one or in small groups. The project was managed through the cooperative efforts of the principal, the teaching staff, and technical experts on staff who offered advice and guidance.

15. **Transforming the Learning Environment** used inquiry-based learning to complete integration of technology into two units of study. Teachers established a Web presence for their courses using WebCT. Teachers were supported by on-site, full-time technical support (an IT team) and administrators (via release time) while they worked on increasing their proficiency with technical tools through one-on-one, small group, or "just-in-time" professional development. Staff initiated a database of technology-rich units and further resources for integrating technology into core curricula. A project director, in concert with the technology expert, managed the project. The development of a student help desk group was noted to be particularly helpful.

16. **Technology Mentorship Program**: An AISI Lead Technology mentor was involved in the development of a humanities-based PowerPoint presentation. Also, through mentorship, students developed a school Web page, and used digital cameras and video capture to enhance core academic work. Teachers had access to pods of computers so that ICT outcomes could be infused directly into core curricula within the classroom. Teachers designed lessons that incorporated technology with added confidence when a consistent technical environment was provided, including new hardware, software, and networking in-services to assist the teachers in keeping the computers running. Projects included a *TELUS Learning Connection* social studies submission.

17. **Mobile Computer Lab** provided access to technology learning tools in schools through the provision of a mobile lab of 18 computers that each school had access to for 12 weeks. On-site technical support, one-on-one professional development, and the mobility of the computers allowed teachers to both learn and teach as they worked through action research learning projects. Professional development included training in inquiry-based learning, as well as software applications, which teachers then used to collaboratively develop learning projects that integrated technology into core curricula.

18. **Computer Literacy Improvement** focused on upgrading computer labs, texts, and software, and training teachers to use the technology through in-service workshops, IT workshops, teacher conventions, and peer tutoring. Instructional strategies included using the lab for individual- and small-group instruction, encouraging students to use IT for core assignment completion, and teaching basic keyboarding and other skills to students. The principal, who made sure that equipment and support services were readily available, managed the project. Parents helped with online research and troubleshooting the equipment.

19. **Information Literacy** utilized peer teaching, in-service workshops, and AISI teacher mentoring to provide ongoing support for teachers, in classrooms and in computer labs, as they created projects

that integrated technology into core subjects. A full-time AISI teacher was scheduled into two-month blocks per school, providing full onsite teacher support during the two-month sessions. With one-on-one and small-group support, technology was infused into core curricula and teachers continue to share strategies with each other. Parents fundraised to bring technological resources to the school.

20. **Research Skills and Resource Enhancement** included a technological upgrade to the library to enhance students' research capabilities and resources. The library technician upgraded software and hardware and also supported teachers and students in learning new technology. Applied research skills in science and social studies showed excellent growth. Professional development was also provided, as needed, through in-service workshops. The parent-based board and the administration team managed the project. Parents monitored and had a strong voice in strategies and allocation of resources.

21. **Outcome-based Learning with Technology**: Through the provision of adequate technology infrastructure (quality and quantity), this project increased access to technology, and provided "built in, just-in-time" staff training and ongoing support. Once trained through peer-to-peer and small-group sessions, teachers used a variety of strategies appropriate to various grades, ages, and skill levels to integrate technology into core curricula. Student peer-to-peer sharing of skills and knowledge among multiple grades and ages was common. An AISI teacher/coordinator, in collaboration with staff and the board, managed the project.

22. **Technology Integration #5**: The final year of this three-year project focused on teaching two semesters of 10-week (technology) course offerings at six different levels (software specific, not grade specific), and doubling the Web design course offering. Students wrote English and social studies diploma exams on computers, used word processing in their career and life management (CALM) courses, and employed a new projector in an excellent graduation PowerPoint presentation. Staff also implemented a C++ programming course for Grade 11 students. Professional development was provided through in-service training.

23. **Information Technology Integration** upgraded labs and had a full-time IT teacher offering instruction to high school students in CTS modules. Students learned word processing, keyboarding, graphics, database, spreadsheets, hypermedia tools, and PowerPoint to complete assignments and projects. Through professional development workshops and seminars, teachers learned the basics of these tools and then applied their new technology skills to enhance student learning by using technology in assignments across the curricula. The IT teacher helped individual teachers at various grade levels to determine ways in which they could integrate technology in their subject areas. The IT teacher also worked with individual classes and provided on-site assistance when needed. The principal and the IT teacher managed the project by ensuring appropriate resources and training were in place.

24. **Learning Enhancement in Math & Science** used commercial software to develop students' skills in math and science. Staff were trained and supported through a full-time equivalent staff position to adapt their course content and teaching practices to this new system. The program used is a sensory-cognitive system based on the natural functioning of the brain and designed to significantly increase the user's ability to recall his or her training on demand. The result is a continuously tailored learning program for each individual using multimedia and multisensory approaches. An AISI coordinator worked with staff to ensure teachers were familiar with the program, coordinated all professional development, and managed the project. The teachers continued to create multimedia versions of their subjects, thus increasing course offerings.

25. **Technology Resources** provided in-service technology training for teachers to increase technology integration into core curricula. Hardware and software purchases increased resources and access for students. The ICT outcomes were divided up according to grade, or in upper grades, according to subject-specific outcomes. Professional development was arranged and provided on an individual level, as needed, instead of through an imposed school-wide PD. Computer purchases were augmented by private donations.

Appendix Three
Overview of Projects

This appendix provides a synthesis overview of the medium- and high-effect size AISI technology projects. The ratios provide some interesting statistics about various elements of the projects.

Project Management

- 10 of the 25 projects were managed by administrators and/or AISI/ICT Coordinators.
- 8 of the 25 projects reported that having teachers collaboratively plan, set, and track ICT integration goals or outcomes was critical to the success of the projects.

Professional Development

- 16 of the 25 projects provided professional development through one-on-one support and/or small-group work on-site, *during regular classes*, as opposed to separate, off-site sessions.
- 18 of the 25 projects hired a dedicated, in-house, ICT Coordinator/teacher for professional development and/or project management. Other projects used existing school-based expertise, such as library technicians and highly skilled teachers. All projects had one person who was technologically skilled as a resource for professional development, planning, and implementation of ICT integration.
- 17 of the 25 projects used collaborative, peer-to-peer, or mentorship models for professional development *and* student ICT training.
- 5 of the 25 projects used release time to allow teachers to work on individual skills and ICT learning projects, either one-on-one with AISI/ICT lead teachers or in small groups.

Nature of Projects

- 24 of the 25 projects reported that it took three to four years to implement ICT integration into core curricula successfully. Not one school was able to do so in just one year.
- 23 of the 25 projects used AISI funding to purchase or upgrade computers, digital cameras, projectors, or other software and hardware for the school.
- 20 of the 25 projects embedded or integrated technology into daily curricular lessons, with the intention of making the technology "invisible" or not the key focus of learning.
- 18 of the 25 projects created, developed, and published new technology-based resources, including Web sites, project databases, or manuals as a legacy of learning for other teachers and students to utilize.
- 11 of the 25 projects used project-based, small-group instructional strategies to integrate technology into core curricula.

Parent Involvement

- 20% of the projects reported that parents were involved in the ICT projects in either celebratory events (PowerPoint shows and Web sites) or more participatory roles (planning committees and fundraising for computer equipment).